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Assessment of Biodıversıty and Ecosystem Services in Azerbaijan: Challenges and Experıences

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The aim of this paper is to establish a brief overview on the status of biodiversity and ecosystem services in Azerbaijan in the context of international science-policy interface within modern global concepts. These issues are discussed using the results of the analysis of state or public reports and scientific literature on biodiversity in Azerbaijan, as well as the outcomes of own studies the drivers of change and trends in biodiversity within the framework of the strategy and policy for biodiversity conservation. The existing knowledge gaps and needs for filling them have been also identified.

Keywords: *Biodiversity, ecosystem services, science-policy interface, conservation strategy, Azerbaijan*

The conservation and sustainable use of natural resources is one of the sources for social, political, and economic challenges of the 21st century. In the context of the rapid degradation of nature, it is still important to assess drivers, impacts and responses to biodiversity that is considered as an integral part of natural resources. In order to a clear understanding of these issues in Azerbaijan we here propose a brief insight into biodiversity in the context of ecosystem services, and the main assessments on biodiversity.

Biodiversity is the living fabric of our planet that includes variability within species, between species (genetic diversity) and of ecosystems. It may underpins some essential services to humanity, from material goods (for example, food, timber, medicines, and fiber) to underpinning functions (flood control, climate regulation, and nutrient cycling), and nonmaterial benefits such as recreation (MA, 2005). Biodiversity can also contribute to agriculture through pollination and pest control (Hooper et al., 2005), provide carbon storage and sequestration (MA, 2005), and positively affect human physical and mental health (Barton and Pretty 2010). The economic value of benefits from biodiverse natural ecosystems may be 10 to 100 times the cost of maintaining them (TEEB, 2009).

Threats to biodiversity. However, many of these benefits, known as "ecosystem services," are in serious threat because of the increased effect of biotic factors, anthropogenic pressure and natural disasters. Over-exploitation of natural resources, expanding land-use change invasive alien species, pollution, climate change, especially degradation, and fragmentation of habitats are all key pressures affecting biodiversity loss around the world (MA 2005; Butchart et al., 2010; IPBES 2018; Ali-zade and Salimov, 2015).

These impacts shows a continued, dramatic overall decline richness in global and local biodiversity, resulting in unprecedented losses in biodiversity at all levels, from genes and species to entire ecosystems with including ecosystem processes and functions. Due to the most recent assessments of some taxonomic groups, 11% of the world's of legumes are threatened with extinction (Brummitt et al., 2015), as are 41% of amphibians (IUCN), 15% of reptiles (Böhm et al., 2013), 14% of birds (IUCN), 25% of mammals (IUCN), 16% of pteridophytes (Brummitt et al., 2015), 18% of monocots (Brummitt et al., 2015), 40% of gymnosperms (Brummitt et al., 2015), and 1616 63% of cycads. If trends will continue at such a rate, the worldwide and local loss of biodiversity and degradation of ecosystems will cause a mass extinction event, and also reducing the services they can provide (Fig. 1).

Biodiversity and ecosystem services decline not only an irreversible loss of the Mother Earth, but also flag other important issues, such as the threat to future food security and good quality of life that nature provides represent everything from the food we eat to the air we breath (Diaz et al., 2015; Cardinale et al., 2012; Hooper et al., 2012).

Therefore decision makers need to be sufficiently and clearly informed on how biodiversity underpins these services, the demand for them, the capacity of ecosystems to provide them and the pressures reducing that capacity. This implies the existence of a scientifically based programs assessing the biodiversity and ecosystem services considering them as a part of an interconnected system.

International Science-Policy interface for conservation of biodiversity and ecosystem services. As a result of wide political recognition regarding the imperative to reduce anthropogenic

environmental impacts, and other drivers influence on biodiversity, the United Nations Convention on Biological Diversity (CBD) were adopted in 1992.

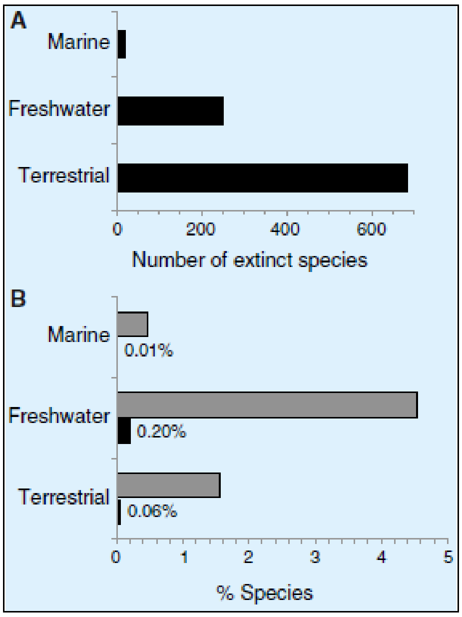


Fig. 1. Extinctions. (A) The number of extinct species amongst the 226,000 marine, 126,000 freshwater and 1,150,000 terrestrial named species. (B) The percentage of species in these environments that are extinct (black bars) and threatened (hollow bars). Source: Costello (2015).

There is an increasing array of national, regional, and international policy mechanisms aimed at biodiversity conservation; for example, 87% of the signatories to the CBD have now developed National Biodiversity Strategies and Action Plans (NBSAPs). Thus, NBSAPs are the principal instruments for implementing the Convention at the national level (Article 6) and have frameworks for tackling biodiversity loss at local scales (CBD, 1995; Butchart et al., 2010).

The first comprehensive large-scale international biodiversity assessment was the Global Biodiversity Assessment (GBA 1995) which for the first time, mobilize teams of experts involving some 300 authors from over 50 countries, and covering many different disciplines in the biological, economic and social sciences to evaluate the global status of biodiversity. GBA had almost no impact on policy formulation, because it did not have a mechanism for involving many (multiple) stakeholders, including decision-makers and was not an intergovernmental process (Watson and Gitay, 2007).

Millennium Ecosystem Assessment (MA, 2005) was another major, one-time global biodiversity assessment designed to respond to the scientific needs of the biodiversity-related conventions. It was carried during 2001-2005 and assesses the status and trends in biodiversity, ecosystems and their services, possible future scenarios, options for action. The MA has had little impact on policy formulation and decision-making because their findings were formally approved by their Board and not Governments.

The most comprehensive assessment on biodiversity and ecosystem services to date is the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) that was launched in 2012. The IPBES is an independent intergovernmental body which serve as an assessment mechanism by synthesizing global, sub-regional and regional assessments, as well as assessments on specific thematic and methodological issues such as pollination, scenarios and models, land degradation and restoration, values, invasive alien species, and sustainable use of wild species. The IPBES provides policymakers with objective scientific knowledge foundations for better policy through science for the conservation and sustainable use of the planet's biodiversity, ecosystems and their services, long-term human well-being and sustainable development. To guide the assessment process IPBES has developed and applied a Conceptual Framework (CF) that is a highly simplified model of the complex interactions between the nature and human societies (Díaz et al., 2015; Fig. 2). The IPBES CF for biodiversity and ecosystems services provide an integrated view of the biodiversity knowledge–policy interface with the consideration of diverse disciplines in the sciences and humanities (natural, social, engineering, health sciences, history), as well as broad range of stakeholders (the scientific community, governments, international organizations, indigenous and local communities), and their different knowledge systems (sciences and humanities, indigenous, local and practitioners' knowledge). The IPBES CF provides structure and comparability to the assessments at different spatial scales, on different themes, and in different regions.

The IPBES scientifically credible and policy-relevant assessments do not generate new data, but seek to create new understandings of the causes of the loss of nature and nature's contributions to people through synthesis and sorting of academic literature, as well as insights from indigenous and local knowledge using different methods. The broad range of stakeholders – contributors (scientists, research and educational institutions, indigenous, local and practitioners' knowledge holders), and end users (governments, multilateral environmental agreements, UN agencies, inter-governmental organizations, non-governmental organizations (NGOs), other practitioners within the private sector and the public) were involved in these assessments.

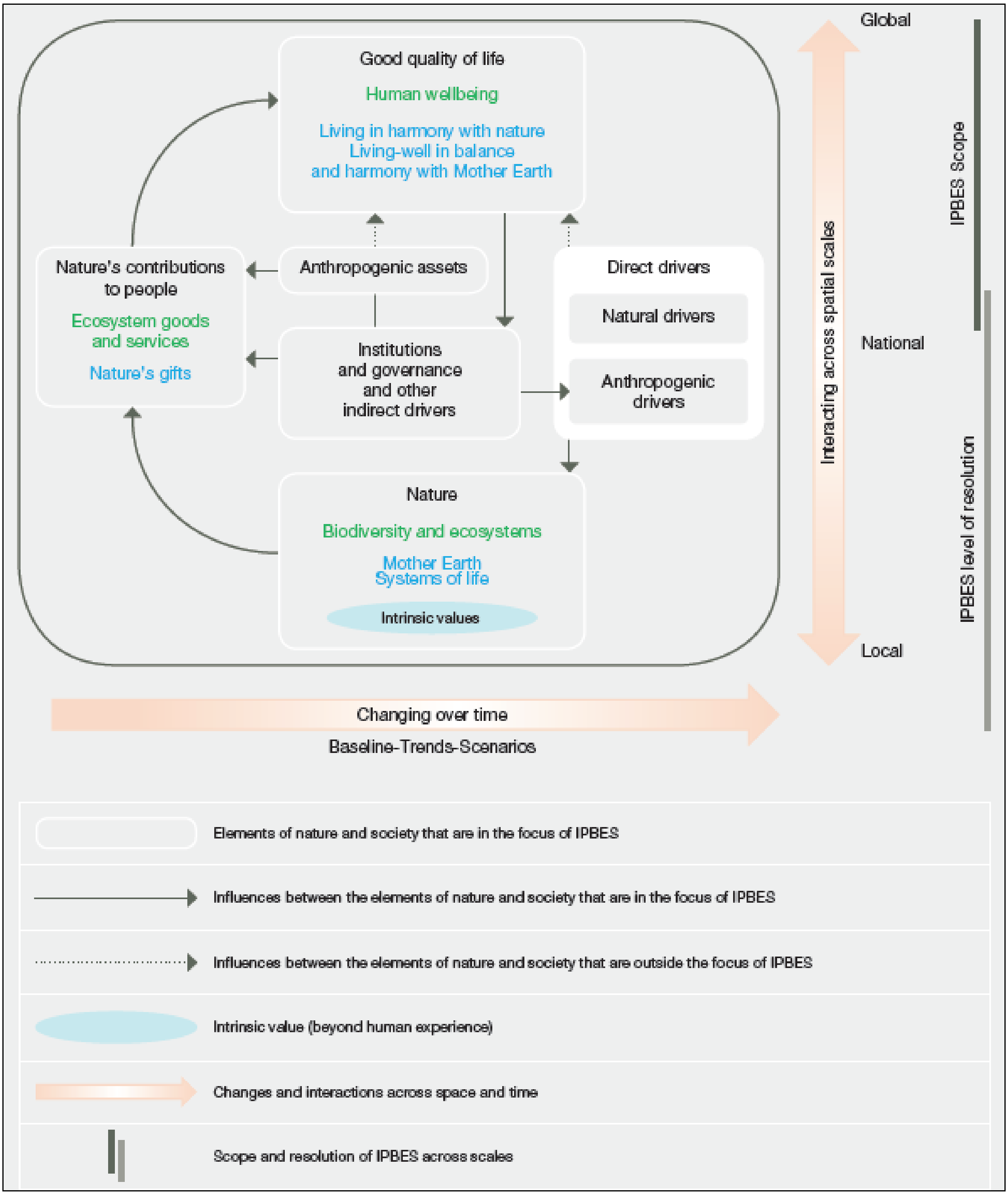


Fig. 2. The IPBES Conceptual Framework (CF) (Texts: in **black** – inclusive category labels intelligible for all stakeholders; in **green** – category labels in western science; in **blue** – category labels of other knowledge systems). Source: Díaz *et al*. (2015).

For example, the IPBES Regional Assessment for Europe and Central Asia (IPBES 2018) is based on a request from Governments, multilateral environmental agreements and other stakeholders to investigate the following key policy questions:

– How do biodiversity and ecosystem functions and services contribute to the economy, livelihoods, food security, and good quality of life in the regions, and what are the interdependences among them?

– What are the status, trends and potential future dynamics of biodiversity, ecosystem functions and ecosystem services?

– What are the pressures driving the change in the

status and trends of biodiversity, ecosystem functions, ecosystem services and good quality of life?
- What are the actual and potential impacts of various policies and interventions on the contribution of biodiversity, ecosystem functions and ecosystem services to the sustainability of the economy, livelihoods, food security and good quality of life?
- What gaps in knowledge need to be addressed in order to better understand and assess drivers, impacts and responses of biodiversity, ecosystem functions and services?
- How can ecosystems those underpinning ecosystem-based adaptation to climate change and nature-based solutions to sustainable development, be protected through investments, regulations and management regimes for terrestrial, freshwater, coastal and marine systems?

Answering the specific key questions offers important knowledge concerning progress toward the Aichi Biodiversity Targets, the Sustainable Development Goals, and national policies (IPBES, 2018).

The two flagship global reports - Global Biodiversity Outlook (GBO) series and the Global Environment Outlook (GEO) series are the periodic publications of the Convention on Biological Diversity and UN Environment Programme (Urho 2009), respectively. GBO is a periodic report that summarizes the latest data on the status and trends of key drivers for biodiversity loss, and effectiveness of implementation measures being taken by the global community for conservation and sustainable use of biodiversity, and also draws conclusions relevant to the further implementation of the Convention. The first report was published in 2001. The upcoming fifth edition, GBO-5, will be launched in 2020. It is important for the post-2020 global biodiversity framework and reporting on a target-by-target analysis of progress towards the achievement of the Strategic Plan for Biodiversity 2011-2020 and its Aichi Biodiversity Targets, and their contribution to the Sustainable Development Goals; provide data on the thematic, regional and global assessments of the IPBES and any relevant scenario analysis and modelling of biodiversity and ecosystem services undertaken as part of these assessments.

GEO was initiated at the request of the UNEP Governing Council in 1995 to create scientific information on the state of the world's environment and aims to facilitate the interaction between science and policy via informing not only governments but also various stakeholders such as the youth, businesses and etc. It provides an independent integrated assessment of the social, economic and environmental trends, the effectiveness of the policy response to address these environmental challenges and the possible pathways to be achieve various internationally agreed environmental goals over the past two decades. The first publication was in 1997.

In this article we discussed the scope and achievements on assessment of biodiversity in the context of ecosystem services, using the result of the analysis of state or public reports and scientific literature on biodiversity in Azerbaijan, as well as the outcomes of own studies. We draw on a broad range of these efforts through outline the key challenges, experiences and perspectives in Azerbaijan.

STATUS AND TRENDS OF BIODIVERSITY CONSERVATION IN AZERBAIJAN

Along with the diverse geographic, biological and climatic conditions in Azerbaijan has provided the higher levels of biological diversity in its flora and fauna over time. Biodiversity of Azerbaijan with the rich natural resources is the source of our present and our future, and provides valuable material (e.g. food, medicinal resources), regulating (e.g. pollination, air and freshwater quality regulation) and non-material contributions to people (e.g. learning and inspiration). It supports sustainable development which is essential for the quality of life as they have economic, social and cultural values (IPBES, 2018).

The issues on conservation and sustainable use of biodiversity are reflected in the government's main strategic documents. As a parties to the United Nations Convention on Biological Diversity (CBD, 1992), Azerbaijan ratified the Convention in 2000, and formally recognised the provisions and principles of the Convention and therefore its national legal frameworks comply with the requirements of the convention.

Strategy and policy framework. Since gaining independence, the Nationwide Leader Heydar Aliyev developed. The principles of the Azerbaijan's national policy in the field of environmental protection and ecology. On the initiative and under leadership of the academician Jalal Aliyev developed the National Program on genetic resources of biodiversity, and to fulfill commitments during the research on biodiversity and conservation, which was the most important requirement of time. At present, Mr. President Ilham Aliyev attaches great importance to the protection and rational use of biodiversity in our country (Ali-zade and Salimov, 2015).

Environmental protection and use of natural resources in the country are based upon the principles declared in the Constitution of the Azerbaijan Republic (1995).

Issues related to environment policy for protection and sustainable use of natural resources in Azerbaijan has been also reflected in other legislative documents (Government of Azerbaijan 2014) such as:

- *NATIONAL STRATEGY of the Republic of Azerbaijan on Conservation and Sustainable Use of Biodiversity for 2017-2020 (2016);*
- *The State Programme for Poverty Reduction and Sustainable Development in the Azerbaijan Republic* (SPPRSD, 2008-2015);
- *The State Programme for the Socio-economic Development of the Regions of the Azerbaijan Republic* (2009-2013);
- *The State Strategy on Use of Alternative and Renewable Energy Sources* (2012-2020);
- *The State Program on the reliable food supply of population in the Azerbaijan Republic* (2008-2015);
- *The National Program on forest restoration and expansion*;
- *National Program "On Environmentally sustainable social and economic development (2003);*
- *State Program on Efficient Use of Summer Winter Pastures, Hayfields and Prevention of Desertification in the Republic of Azerbaijan (2004);*
- *Comprehensive action plan on improvement of the environmental situation for 2006-2010 in the Republic of Azerbaijan*

On October 3, 2016, the President of the Republic of Azerbaijan endorsed an updated National Biodiversity Strategy and Action Plan (NBSAP) for the 2017-2020, including national biodiversity targets, with the global framework being taken into account. The document formulates a comprehensive policy and defines national priorities in order to "*sustainable use of genetic resources; conservation of biodiversity and transfer to future generation; improving biodiversity monitoring systems; promotion of environmental education including biological diversity and ecosystem services; ensuring transition to a "green economy"; reducing the negative impacts and threats to biodiversity, and strengthening institutional capacities in the planning, management and use of biodiversity*".

Beside the abovementioned documents, it is necessary to add that the National Caspian Action Plan (2002) and the Framework Convention for the Protection of the Marine Environment of the Caspian Sea (2006) are key instructions and policies to maintain legislative environment focused on conservation actions in Azerbaijan's territorial waters of the Caspian Sea. The recently adopted the Convention on the legal status of the Caspian Sea (Aktau, 2018) aims strengthening governmental capacities on rational management of Caspian Sea resources, as well as exploration, protection and conservation of its environment.

Drivers of change in biodiversity. Globally across all regions, as well as in Azerbaijan, biodiversity loss and natural habitat decline directly negatively impacts on the nature's contributions to people and good quality of life, respectively (Government of Azerbaijan, 2014). The main drivers and pressures on ongoing biodiversity loss and ecosystem decline in Azerbaijan are:

- land degradation;
- habitat fragmentation;
- unsustainable levels of natural resource use;
- pollution;
- invasive alien species;
- climate change.

Trends in biodiversity. The Greater and Lesser Caucasus regions and Talysh Mountains are distinguished with the highest level of the flora and fauna diversity. In Azerbaijan, nearly 5,000 plant species occur, representing around 65 % of the Caucasus' plant diversity. Of these approximately 200 species are national endemics and 950 species Caucasian endemics (Solomon et al., 2013). There are 107 mammals, over 394 of birds, 154 reptiles, around 10 of amphibians and 102 species of fishes, and approximately 25,000 species of invertebrates in Azerbaijan.

At present, because of the lack of regular monitoring and limited data, there is scarce information available on dynamics of populations of species listed in the Red Book of Azerbaijan (RDB 2013). Currently 213 (80%) plant species are evaluated as threatened (25 critically endangered, 53 endangered and 135 vulnerable). Another 52 plant species are listed as near threatened About 26 species of the evaluated fungi and lichens (96%) are threatened (Fig. 3).

36 vertebrate (25%) and 15 invertebrate (60%) species are listed as threatened, respectively. There is a remarkably high percentage of insect species with unknown population trend, and considered as not evaluated (about 67% of invertebrates) (Fig. 3).

Based on the surveys conducted, these high percentage indicate a significant increase in the number of threatened species which were listed in the first edition of Red Book of Azerbaijan (1989), and require under various projects to develop a regular and extensive research and monitoring capacity of the various institutions of the Azerbaijan National Academy of Sciences.

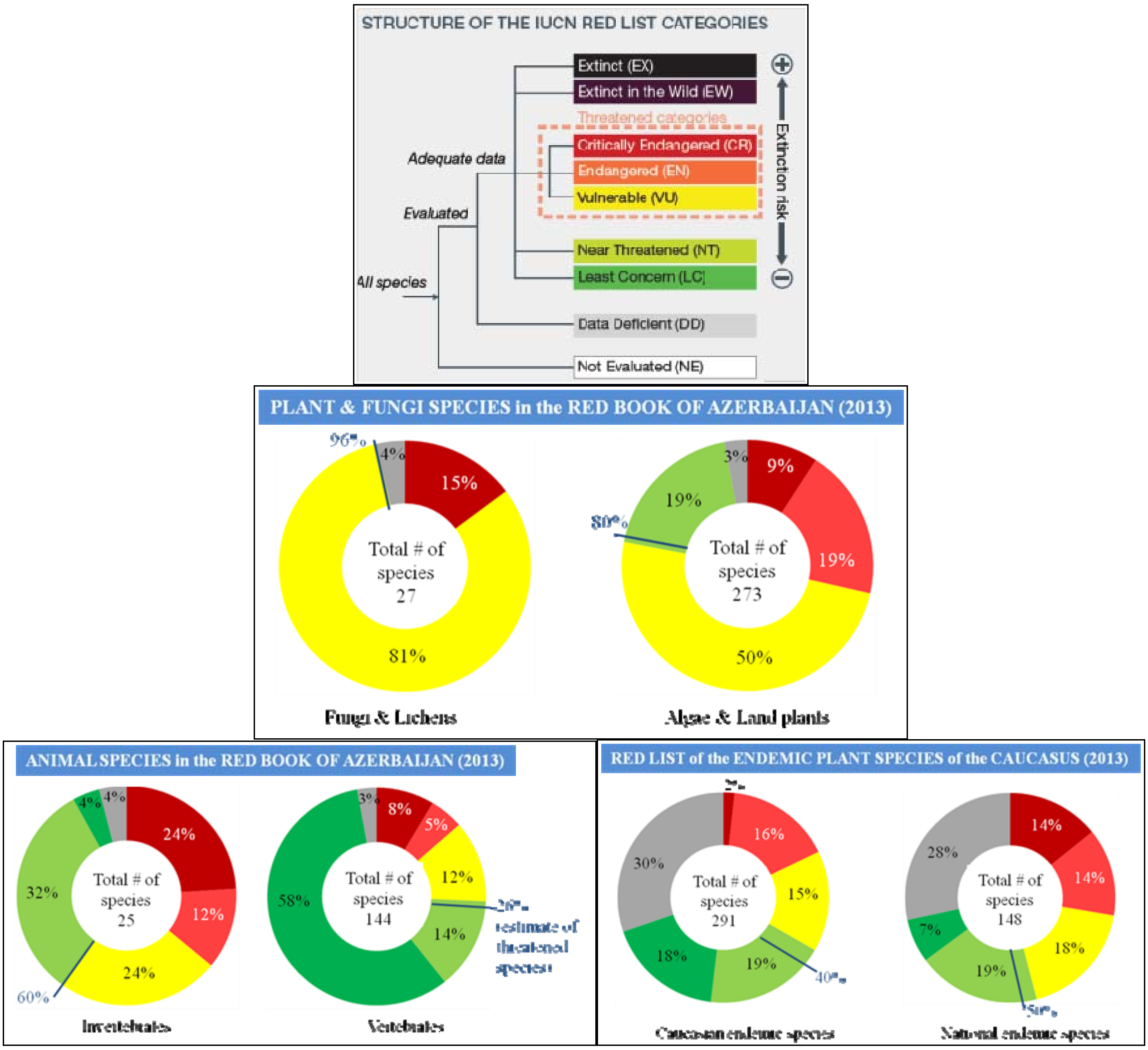


Fig. 3. Extinction risk of species in Azerbaijan according to IUCN Red List Categories.
The blue bar is the best estimate of the proportion of threatened and extinct species, assuming that the same proportion of DD species is threatened or extinct as of species with sufficient data (i.e., EX, CR, EN, VU, NT, LC). Only species in comprehensively assessed taxonomic groups are considered. Source: Red Book of Azerbaijan (RDB 2013) and Red List of the Endemic Plants of the Caucasus (Eds. Solomon et al. 2013).

The plants and animals of the various ecosystems provide people with many resources necessary for their daily lives and with economic values as well. Products of a number of wild and cultivated plants are widely used as a food source such as wild fruits, nuts, berries, mushrooms, and edible greens, tubers, and other plant products that are seen in markets. Some of them used as timber materials, medicinal plants and etc. A 1547 medicinal plant species which belonging to 740 genera and 78 families, were reported as diuretic (444 species), antibacterial (362), anti-inflammatory (249) and having other healing effects.

The natural pastures of Azerbaijan also provide fodder for domestic sheep, goats and cattle. Due to for their caviar, sturgeon fishes have a high economic value in Azerbaijan. Therefore overfishing is still the main threat to Caspian fishes. Besides overfishing of freshwater fish species, a main threat for them is the destruction or modification of their habitat, including a change in the river continuum with the construction of dams and weirs that fragment populations.

Migratory and resident birds, particularly waterfowl, are widely and illegally hunted throughout the country, providing food for villagers and also seen for sale along roads through some districts. Forest animals like wild boar, Caucasian tur and smaller game are also hunted for meat by locals (Foster-Turley and Sultanov, 2010).

Land-use change, including agricultural intensification and urbanization has a multi-scale impact on biodiversity and ecosystem services in both directions. In despite of there are examples of

sustainable agriculture policies and practices (e.g. organic farming) in recent years, land conversion and land-use change due to industrial, infrastructural and other forms of economic development poses a particular threat to loss of (semi-) natural habitats, including valued wildlife species of flora and fauna (IPBES, 2018).

Land area in Azerbaijan was reported at 82663 km^2 (95.45 % of total area) in 2016, according to the World Bank collection of development indicators, compiled from officially recognized sources (Fig. 4).



Fig. 4. Land area in Azerbaijan (% of land area). Source: World Development Indicators database.

47698 km^2 or 57.7% of land area is classified as agricultural land which is divided into arable land, permanent crops land, and permanent pastures and meadows. According to estimates, agricultural land use has expanded between 2004 and 2016. These trends are consistent across the agricultural land types (Table 1).

Table 1. Trends in agricultural land use types in Azerbaijan (2004-2016).

Agricultural land type	Profile	2004-2016
Arable land	*land cultivated for crops like wheat, maize, and rice that are replanted after each harvest*	↗
Permanent cropland	*land cultivated for crops like citrus, that are not replanted after each harvest, and includes land under flowering shrubs, fruit trees, nut trees, and vines*	↗
Permanent pastures and meadows	*land used for at least five years or more for forage, including natural and cultivated crops*	↗

Source: World Development Indicators database. ↗ indicate moderate and consistent increase in indicator.

According to the World Bank collection of development indicators, since the 1990s, the forest area in Azerbaijan are expanded up to 11394 km^2, which means it comprises 13.78% of land area of country (Fig. 5).

Intensive plantation forestry, including planting of greenery urban areas using introduced exotic plant species can be give rise to undesirable, and hazardous effects to loss of habitat and associated species turnover.

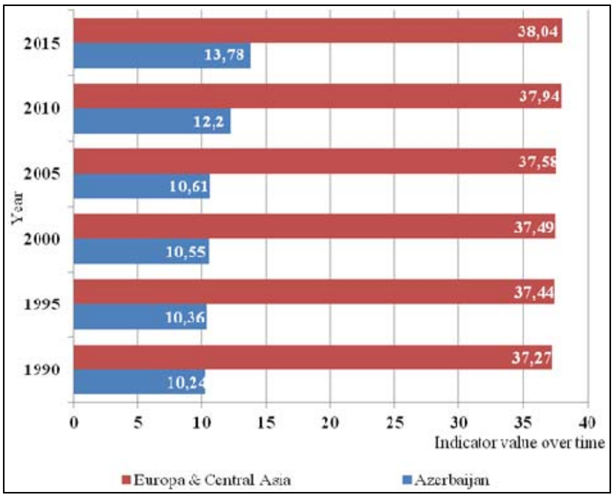


Fig. 5. Forest area in Azerbaijan (% of land area). Source: World Development Indicators database.

One key indicator for the land use change is the habitat fragmentation and land degradation, including extensive salinization, widespread soil erosions, large-scale use of fertilizers and pesticides, as well as socio-economic drivers including the increasing demand for living space per person, and increased mobility and growth of transport infrastructure. Hence, increasing intensity of salinization and erosion of soils tend to be result decline of the productive soil layer with its water regime that lead to desertification and deforestation.

In Azerbaijan ~42.5 % (3.6 million ha) of total areas are eroded, and ~7% (0.3 million ha) of total areas are salinized, as a result of which the widespread degradation of agricultural land is expected (Government of Azerbaijan 2014).

In recent decades there is a trend to expand the protected areas in conservation of nature, including biodiversity and nature's contribution to people. Protected nature areas for the end of 2017 cover 10,3 % of the country territory, where there are 11 state natural reserves, 9 national parks and 24 state natural sanctuaries (Fig. 6).

But it is significant fact that protected areas alone cannot prevent biodiversity loss, particularly for migratory species or habitats or species particularly sensitive to environmental change (Mora & Sale, 2011; Strayer & Dudgeon, 2010). A global systematic review shows that individual protected areas were effective at protecting habitats, particularly forests, but less effective at conserving populations of species (Geldmann et al., 2013).

Agriculture is a highly climate sensitive sector, and therefore, Azerbaijan's rural population and their livelihoods are vulnerable to climate change. The impacts of climate change may have severe consequences for the nature, including biodiversity and nature's contribution to people. The vulnerabilities (high risk of natural disasters, severity of impacts from anthropogenic activities)

and the effects of the changing climate functionally affecting ecosystems and eventually causing decline in biodiversity and ecosystem services.

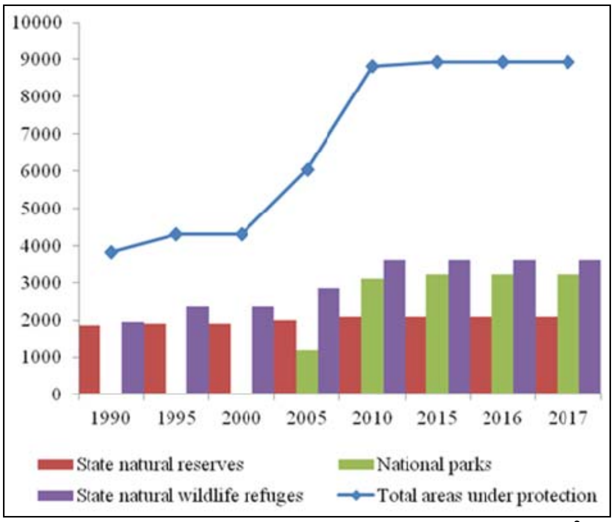


Fig. 6. Terrestrial protected areas in Azerbaijan (km^2). Source: Database of the State Statistical Committee of the Azerbaijan Republic.

It is important to evaluate how climate has varied and changed in the past. The monthly mean historical rainfall and temperature data can be mapped to show the baseline climate and seasonality by month, for specific years, and for rainfall and temperature. As a result of the analysis of possible climate changes in Azerbaijan the temperatures are increasing (Fig. 7). The chart below shows mean historical monthly temperature and rainfall for Azerbaijan during the time period 1961-1990 and 1991-2015.

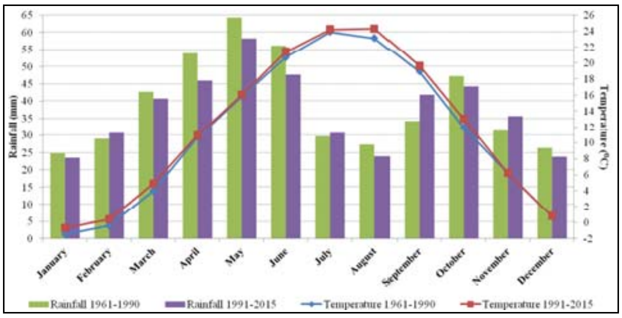


Fig. 7. Average Monthly Temperature and Rainfall for Azerbaijan from 1961-1990 and 1991-2015. Source: World Development Indicators database.

Studies suggested that the temperatures are expected to continue increasing, and while the trends and scenarios for average precipitation are more varied, they are tending to decrease (Table 2). Climate models indicate an average annual increase of 1.5-1.6°C by 2021-2050 and 3-6°C by 2070–2100 across the entire country. Maximum temperatures are also predicted to increase and may reach 47-53°C. There is less certainty about precipitation trends. (Shatberashvili et al., 2015). Extreme weather events in the future may lead to directly impact the overall water balance, and increasing the hazards, and the various risks related to the economy, including the agriculture, human health and safety.

Climate change leads to more extreme and less predictable weather events (heat waves, droughts, floods, heavy precipitation, and wind storms) that impact biodiversity across ecosystems. These trends will cause to shift seasonal timing, growth and productivity, species ranges and habitat location, which affect biodiversity, agriculture, forestry and fisheries. Many species with limited capability to migrate or adapt fast enough for corresponding to projected climate change.

Table 2. Observed climate change and scenarios for Azerbaijan.

	Observed	Scenarios
Temperature	↑	↑
Extreme temperature (+)	↑	↑
Precipitation	↓	↑↓

Source: Second National Communication of Azerbaijan, 2010. (↑- indicates increasing trend, ↓- decreasing trend, ↑↓- mixed trend).

Invasive alien species are among the important direct drivers of loss of biodiversity and nature's contributions to people across Europe and Central Asia as well as in Azerbaijan, especially in combination with other direct drivers (IPBES, 2018).

Invasive alien species generally tend to have negative effects on biodiversity, including displacement and extinction of native species, gene pollution, homogenization of communities, modification of biological interactions, communities, habitats and ecosystem functions, with consequences for human health; and agricultural and economic production (Katsanevakis et al., 2014; Vilà et al., 2010). Some alien species, and even some invasive alien species, have positive impacts, which include provision of the habitat; increasing local species richness and associated ecosystem services, with subsequent economic gains; ecosystem engineering; and aesthetic and cultural value (Schlaepfer et al., 2011). Data limitations across Azerbaijan impede assessment of trends associated with invasive alien species. Priority should be given to improving the evidence-base for impacts of invasive alien species.

Progress towards the 2011-2020 Aichi Biodiversity Targets. The Strategic Plan for Biodiversity 2011-2020, including its 20 Aichi Biodiversity Targets under five Strategic Goals provides a framework for the management and policy development on biodiversity within a framework of United Nation Systems.

There is a lack of well established both

quantitative indicators and qualitative information, as well as absence of a consolidated biodiversity monitoring system suitable for statistical extrapolation to judge progress towards the Strategic Plan for Biodiversity 2011-2020 and its Aichi Biodiversity Targets (Government of Azerbaijan, 2014). Therefore assessment of country report on progress in the implementation of the Aichi Targets relies on more qualitative systematic review of the literature (Table 3).

Table 3. Summary of Azerbaijan's current state of progress towards the Aichi Targets.

Strategic goal A: address the underlying causes of biodiversity loss by mainstreaming biodiversity across government and society	1		↔		
	2		↔		
	3	↕			
	4		↔		
Strategic goal B: reduce the direct pressures on biodiversity and promote sustainable use	5		↔		
	6		↔		
	7		↔		
	8		↔		
	9		↔		
	10			√	
Strategic goal C: to improve the status of biodiversity by safeguarding ecosystems, species and genetic diversity	11		↔		
	12			√	
	13			√	
Strategic goal D: Enhance benefits to all from biodiversity and ecosystem services	14		↔		
	15			√	
	16				
Strategic goal E: Enhance implementation through participatory planing, knowledge management and capacity-building	17			√	
	18		↔		
	19		↔		
	20		↔		

Notes: √ symbols indicate successes and positive trends (~51-75% good progress) in the achievements of targets; ↔ shows mixed and variable (~26-50% fair or reasonable progress) in the achievements of targets; and ↕ indicate trend little or failure (~0-25% limited progress) in the achievements of targets. Grey colors without any symbol indicate lack of evidence (insufficient information to score progress.

Filling knowledge and capacity gaps. The lack of availability of comprehensive and up-to-date biodiversity data, information and knowledge remains a challenge. Therefore, there is need for better understanding, quantification and integrating monitoring system of biodiversity in the context of ecosystem services. A few scientific researches have been conducted on biodiversity focused on how direct and indirect drivers impact, status and trends, and a plausible scenarios. Moreover, systematic and integrated investigations, as well as biodiversity monitoring of fungi, plants, animals, species of Caspian Sea and inland freshwaters, and soil organisms are required to better assess this issue for the whole Azerbaijan. There is also necessary to integration of indigenous and local knowledge systems and scientific knowledge to better understand the diverse values of nature and nature's contributions to people. There is also a significant gap in the institutional cooperation between Ministry of Ecology and Natural Resources and various scientific institutions of ANAS in terms of scientific credible assessment projects on biodiversity and ecosystem services.

During the last decades, the scientific-research works and cooperations carried out at the Institute of Botany within the framework of memorandums, contracts and agreements signed with various international scientific organizations have a significant role for the scientific bias of the conservation, sustainable use and development of plant diversity in Azerbaijan as well as implementation of the relevant tasks set out in various State Programs and Action Plans (Ali-zade and Salimov 2015; 2016).

The Institute of Botany has been actively participated in the work programs of regional assessment of biodiversity and ecosystem services for Europe and Central Asia (2015-2017) and Global Assessment (2016-2018).

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Azərbaycanda Biomüxtəliflik və Ekosistem Xidmətlərinin Qiymətləndirilməsi: Çağrışlar və Təcrübə

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Məqalədə müasir qlobal konsepsiyalar çərçivəsində beynəlxalq elm-siyasət interfeysi kontekstində Azərbaycanda biomüxtəliflik və ekosistem xidmətlərinin vəziyyəti haqqında qısa məlumat verilmişdir. Hökumət və ya ictimai hesabatların, elmi ədəbiyyatın təhlili nəticəsində, eləcə də müəlliflərin öz tədqiqatlarının nəticələrinə görə, bioloji müxtəlifliyin mühafizəsi strategiyasının və siyasətinin həyata keçirilməsi çərçivəsində biomüxtəlifliyin dəyişməsinə təsid edən hərəkətverici qüvvələr və tendensiyalar müəyyən edilmişdir. Bu sahədə mövcud bilik çatışmazlığı və onların həlli yolları aşkarlanmışdır.

Açar sözlər: *Biomüxtəliflik, ekosistem xidmətləri, elm-siyasət interfeysi, mühafizə strategiyası, Azərbaycan*

Оценка Биоразнообразия И Экосистемных Услуг в Азербайджане: Вызовы и Опыт

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В статье рассматривается состояние биоразнообразия и экосистемных услуг в Азербайджане в контексте современных глобальных представлений и международного интерфейса науки и политики. На основе анализа государственных документов и научной литературы, а также результатов собственных исследований, определены движущие силы и направления изменения биоразнообразия в рамках реализации стратегии и политики по сохранению биоразнообразия, выявлены возможные пробелы и пути пополнения знаний.

Ключевые слова: *Биоразнообразие, экосистемные услуги, наука, политика, движущие силы, направления, стратегия сохранения, Азербайджан*